

METEOROLOGICAL AND CLIMATOLOGICAL DATA FOR MARCH 1941

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AEROLOGICAL OBSERVATIONS

By EARL C. THOM

Mean surface temperatures for March were below normal over about two-thirds of the United States (chart I). Surface temperatures were above normal west of the Great Divide and over the extreme North Central States with the largest positive departures, slightly over 8° F., occurring along the Washington and Oregon coastal areas. Temperatures were lower than normal over the rest of the country with mean monthly surface temperatures as much as 8° below normal in a small area of the Central Atlantic States.

At the 1,500 m. level the 5 a. m. resultant winds were from directions to the north of the corresponding normals over the eastern two thirds of the country with an opposite shift at this level over most stations to the westward. At the 3,000 m. level the morning resultant winds were from directions to the north of normal over most of the country. Over the southwest and over the extreme west central areas, however, a turning to the south of normal occurred at this level. At 5,000 meters the 5 p. m. resultant winds were from directions to the north of the 5 a. m. normals at nearly all stations for which this comparison could be made.

At both the 1,500 m. and the 3,000 m. levels the 5 a. m. resultant velocities for the month were above normal over most stations in the extreme eastern part of the United States and were below normal quite generally to the westward. At 5,000 meters the 5 p. m. resultant velocities were higher than the corresponding 5 a. m. normals over most of the country; below normal velocities being noted only over the northwest and extreme west central areas.

The directions of the 5 p. m. resultant winds were to the south of the corresponding 5 a. m. winds for March at the 1,500-meter level over most of the country. A shifting of resultant winds to the northward during the day occurred, however over the extreme northeast, over the Gulf coast and over a considerable area in the middle plateau and west central states. At 3,000 meters the evening resultant winds for the month were from directions to the south of the corresponding morning normals over most stations in the western half of the country and over about half of those to the eastward. The resultant winds shifted to the northward during the day at this level over scattered stations in the northeast, the Gulf coast, the Upper Mississippi Valley and the Pacific Northwest.

At the 1,500 m. level the 5 p. m. resultant velocities were lower than the corresponding 5 a. m. velocities over most of the United States. Velocities higher in the afternoon than those in the morning were, however, recorded at this level over the extreme southeast coastal region, over the southwest and over an area in the northwest. At 3,000 m. the increases and decreases in resultant velocity over the various stations during the day were evenly divided, with no well defined areas separating such diurnal changes in resultant velocities.

It is noted that again in March the area of below normal surface temperatures corresponded closely with the area over which at 1,500 meters, the directions of the resultants were to the north of normal.

The upper air data discussed above are based on 5 a. m. (E. S. T.) pilot-balloon observations (charts VIII and IX)

as well as on the observations made at 5 p. m. (table 2 and charts X and XI).

At radiosonde and airplane stations in the United States proper the highest mean monthly pressure was recorded over Brownsville, Tex., at the 4,000-, 6,000-, and 16,000-meter levels, over Miami, Fla., at the 9,000-, 10,000-, 12,000- and 13,000-meter levels, while the corresponding maximum value was recorded over both Brownsville and Miami at all the other standard levels from 1,500 to 16,000 meters, inclusive. The lowest mean monthly pressure was recorded over Portland, Maine, at each of the standard levels from 1,500 to 6,000 meters, over Sault Ste. Marie, Mich., at each of the levels from 8,000 to 16,000 meters, inclusive, while the corresponding minimum, 395 mb., occurred over both Portland and Sault Ste. Marie at 7,000 meters.

At each of the standard levels from 1,000 to 14,000 meters, inclusive, the mean monthly pressures over all Alaskan stations north of 60°N. latitude were lower than the corresponding minimum pressures over the United States proper. At Juneau and Ketchikan the mean pressures at these levels were lower than the corresponding mean monthly pressures recorded over most stations of the United States but were higher than the minima. At all standard levels from 1,000 to 18,000 meters the mean monthly pressures over San Juan were higher than the corresponding maxima for stations in the United States.

The mean monthly pressures were higher than those of last month over most stations of the United States at each of the standard levels from the surface to 11,000 meters while the pressures were generally lower at higher levels. Pressures were, however, lower than last month at some of the levels up to 11,000 meters over a small area in the southwest and were slightly higher than last month at the higher levels over Portland, Maine, over the Great Lakes and over a small area in the middle Mississippi Valley.

In Alaska the mean monthly pressures were higher than last month at all levels over Ketchikan, and were also higher at levels above 1,000 meters over Juneau. Pressures were lower than last month at all levels over Fairbanks and over Anchorage. Over Bethel pressures were the same or higher than in February at levels up to 4,000 meters and were lower at all higher levels, while over Nome pressures were the same or higher this month at all levels up to 15,000 meters and slightly lower at higher levels.

The largest difference between the maximum and minimum mean monthly pressures at any of the standard levels for stations in the United States was 31 mb. at 8,000 meters. Steep pressure gradients appear on the mean pressure charts from north to south over the eastern third of the country, being steepest at the 6,000-, 7,000-, 8,000-, and 9,000-meter levels. At both 7,000 and 8,000 meters, for example, a change of 1 mb. was recorded for each 46 miles of horizontal distance between Buffalo, N. Y., and Washington, D. C., while a similar pressure change was noted at these two levels for a horizontal distance of 50 miles or less between Sault Ste. Marie and Nashville and between Sault Ste. Marie and Pensacola.

Mean monthly temperatures over the United States were generally higher for March than for February at levels from the surface up to and including 3,000 meters. This increase in temperature at the lower levels was especially marked over an area in the North Central States

where the mean temperature of the lowest 1,000 meters of free air averaged about 5° C. higher than last month. At the 5,000-, 6,000-, and 7,000-meter levels temperatures were higher than last month over most stations in the northern third of the country, were lower than last month over the Southwest and West Central States, while the areas of corresponding temperature changes were not well defined at these levels over the balance of the country. At levels above 8,000 meters temperatures were generally lower than last month over stations in the northern third of the country and along the Pacific coast with areas of temperature change not well defined over the remainder of the United States.

Alaskan stations north of 60° N. latitude reported mean temperatures lower than those of last month at most of the standard levels below 10,000 meters while an increase in temperature occurred at these levels over Alaskan stations south of this line. At all levels above 10,000 meters temperatures were lower than those of last month over all Alaskan stations.

Comparison of the mean temperature charts for March 1941 with those for March 1940 show that temperatures at most of the standard levels from the surface up to and including 6,000 meters were higher than those of last year over stations in the United States north of 40° N. latitude and were generally lower than last year at these levels over all stations to the southward. At higher levels the corresponding changes were well distributed, temperatures at most stations being higher than last year at some upper levels and lower at others so that areas of distinct change in temperature from those reported last year cannot be defined for the upper levels.

Only two of the Alaskan stations, Juneau and Fairbanks, were making radiosonde observations during March of last year. At both of these stations temperatures were higher than last year at all levels up to 8 kilometers and were lower than last year at the higher levels for which temperatures were reported.

With the issuance of a Climate and Crop Weather Division publication, Mean Values of Upper-Air Data, by C. L. Rock under date of April 1, 1941, there are available normal data with which the mean monthly upper-air values can be compared. The following discussion of such departures from normal is based on mean values computed by Rock comparing radiosonde data for March 1941 as taken from radiosonde observations with normals for either the same stations or with normals for nearby stations which should be representative of the free-air conditions in each particular area.

At 1,000 meters the mean temperatures were above normal at all stations north and west of a line drawn across the country through Williston and Los Angeles while the opposite departure was recorded at all other stations. Temperatures at Spokane and at Seattle were nearly 3° C. above normal at 1,000 meters while temperatures over an area in the Central Mississippi Valley averaged nearly 7° below normal. At 3,000 meters the areas of departures from normal temperature were the same as at 1,000 meters except that a positive temperature departure occurred at Bismarck, N. Dak., at the higher level. At 5,000 meters free-air temperatures were above normal over the North Central, the Northwest and the West Central sections with negative departures indicated over the remainder of the country.

At 1,000 meters relative humidities were somewhat below normal over the Northwest, the West Central, the extreme Northeast, also over Nashville and Norfolk and were above normal at this level over the rest of the country. At 3,000 meters relative humidities were below normal

over San Francisco, Great Falls, Bismarck, and Norfolk and were above normal over all other stations. At 5,000 meters the relative humidity was somewhat below normal over Bismarck, and over the southern Atlantic coast and over the Southwest and was considerably above normal over most other sections of the country.

There is but little apparent connection between the areas of above normal precipitation for the month and the areas of above normal relative humidities. It was noted, however, that the average departure of relative humidity at the 3,000-meter level for the four stations, Denver, Oklahoma City, El Paso, and San Diego was plus 11 percent and that these four cities roughly border an area in which the precipitation averaged about 225 percent above normal. This apparent relationship for this area at this level however does not hold in other sections of the country, for example, at St. Louis the relative humidity was 18 percent above normal while the precipitation for the two States of Missouri and Illinois averaged 69 percent below normal for the month.

A more consistent relation appears to be that shown by the resultant winds blowing from directions more southerly than is normal for March over the southwestern part of the country at both the 1,500- and 3,000-meter levels. It appears likely that this mass transport of air moving from over the Pacific Ocean waters which are quite warm, resulted in more than the normal amount of moisture over this area. At Phoenix, for example, the normal resultant direction for the month is 285° (WNW) at 1,500 meters and 270° (W) at 3,000 meters while the corresponding resultant directions for March this year were 255° (WSW) and 237° (SW), respectively. Assuming a considerable trajectory over the ocean it appears likely from the values shown on chart 117 of the Atlas of the Climatic Charts of the Oceans that the temperatures of the waters over which these winds moved were about 5° F. higher than the temperatures of the waters over which these winds normally move during March.

The mean surface temperature for March as recorded by radiosonde observations was 0° C. or lower over that part of the northern third of the United States which lies east of Montana. Over other parts of the country this level of freezing temperature occurred at levels varying from 700 meters (m. s. l.) over Omaha to 3,900 meters over Brownsville. Except at three stations the level at which mean freezing occurred was either the same or higher than last month.

The lowest temperature recorded in the free air over the United States was -84.0° C. (-119.2° F.) recorded on March 25 at a height of 17,400 meters (about 11 miles) above sea level over Miami, Fla. A lower temperature -86.4° C. (-123.4° F.) was, however, recorded at 17,400 meters over San Juan on March 18.

Table 3 shows the maximum free-air wind velocities and their directions for various sections of the United States during March as determined by pilot-balloon observations. The highest wind velocity reported for the month was 73.8 m. p. s. (165 m. p. h.) observed over Jacksonville, Fla., on March 12. This wind was blowing from the west-northwest at an altitude of 9,580 meters (about 6 miles) above sea level.

The highest wind velocity observed in the free-air layer below 2,500 meters during March in the last 5 years was 53.0 m. p. s. over Phoenix, Ariz., in March this year. In the free-air layer from 2,500 to 5,000 meters the highest March wind velocity during this period was 70.0 m. p. s. over Albany, N. Y., in 1938, while at levels above 5,000 meters the corresponding extreme 80.0 m. p. s. occurred over Las Vegas in 1939.

CORRECTIONS

1. The data, appearing as a late report for Juneau, Alaska in table 1 in the November 1940 issue of the MONTHLY WEATHER REVIEW were for October 1940.

2. The third paragraph of the annual summary of aerological observations which appears on page 355 of the December issue of the MONTHLY WEATHER REVIEW

should be corrected to show that pilot-balloon and radiosonde observations were started at the two Atlantic Stations in February 1940 instead of in May as stated.

Observations taken prior to May 1940 on board the Coast Guard cutters located as Atlantic Stations No. 1 and No. 2 have not as yet, however, been summarized and published.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during March 1941

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Albuquerque, N. Mex. (1,620 m.)				Anchorage, Alaska (41 m.)				Atlanta, Ga. (300 m.)				Atlantic Station No. 1 ² (3 m.)				Atlantic Station No. 2 ⁴ (3 m.)				Barrow, Alaska (6 m.)				Bethel, Alaska (7 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	17	836	6.4	65	31	998	1.1	69	31	983	5.1	73	25	1,011	11.6	73	22	1,013	15.4	81	31	1,024	-28.1	98	31	1,002	-9.2	79
500					31	943	0.0	70	31	959	5.6	69	25	952	6.7	78	22	954	11.1	81	31	957	-22.6	88	31	942	-5.6	74
1,000					31	885	-2.7	70	31	902	4.0	66	25	895	2.3	84	22	899	7.6	82	31	894	-20.6	81	31	883	-6.8	74
1,500					31	830	-6.6	73	31	848	2.8	61	25	841	-1.0	84	22	846	4.6	83	31	836	-20.0	76	31	828	-9.2	75
2,000	17	798	5.7	66	31	779	-10.9	76	31	797	0.9	58	25	790	-3.4	79	22	795	1.8	79	31	781	-21.2	71	31	776	-12.2	75
2,500					31	730	-13.5	77	31	748	-1.0	53	25	742	-6.0	72	22	747	-0.8	75	31	729	-22.9	65	31	726	-15.2	72
3,000	17	704	-1.1	64	31	683	-16.8	78	31	702	-3.5	49	25	695	-8.3	67	22	701	-3.3	70	31	681	-25.1	63	31	679	-18.3	74
4,000	17	621	-8.0	67	29	597	-22.8	75	30	619	-9.2	45	24	610	-14.4	58	22	617	-8.5	58	31	592	-30.4	61	30	593	-24.7	68
5,000	17	545	-15.2	64	28	520	-29.8	74	30	543	-15.2	46	24	534	-20.7	56	22	542	-15.1	52	31	514	-36.5	59	30	516	-31.2	72
6,000	17	476	-22.5	56	28	451	-37.2	72	30	475	-22.1	44	23	466	-27.5	53	22	474	-21.8	50	30	445	-42.3	30	448	-37.1	65	
7,000	17	415	-30.2	53	26	390	-43.6		27	414	-29.0	41	23	404	-34.1	51	21	413	-28.7	49	30	383	-47.4		30	387	-43.8	61
8,000	17	360	-38.4	50	26	335	-49.6		27	359	-35.8	39	23	350	-40.8		20	358	-35.3	45	29	328	-50.8		30	332	-49.7	
9,000	17	310	-44.9		26	287	-52.9		27	310	-42.1		23	301	-46.6		18	310	-43.5		27	282	-51.3		30	285	-52.5	
10,000	17	266	-51.3		26	246	-53.3		26	267	-48.9		23	259	-52.0		17	266	-50.9		27	242	-50.4		29	244	-52.1	
11,000	17	228	-56.1		25	211	-51.6		24	229	-54.8		22	222	-55.3		16	228	-56.9		25	207	-48.7		29	210	-50.3	
12,000	17	195	-57.3		25	181	-50.6		24	196	-58.4		19	190	-56.5		14	194	-59.1		23	178	-48.1		27	180	-49.0	
13,000	17	166	-56.8		24	155	-49.9		22	167	-58.7		19	162	-55.8		11	166	-58.5		23	153	-48.1		25	154	-49.0	
14,000	16	142	-58.6		24	133	-49.8		20	142	-59.4		18	138	-55.8		9	141	-57.5		20	131	-48.2		24	132	-49.2	
15,000	16	121	-60.0		23	114	-50.2		18	120	-61.7		18	118	-56.5		8	120	-59.2		19	113	-48.7		21	114	-49.8	
16,000	15	104	-61.6		21	98	-50.8		15	102	-63.6		16	101	-56.9		7	102	-60.5		12	96	-49.6		15	97	-50.8	
17,000	14	88	-61.7		13	84	-51.7		10	87	-62.3		14	86	-57.4		7	87	-61.1		10	82	-50.5		11	84	-51.9	
18,000	10	75	-60.3		11	72	-52.8		8	73	-62.1		13	73	-57.6		6	74	-60.0		6				6	71	-52.7	
19,000	6	64	-60.6		7	61	-54.1						10	62	-57.7													

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Bismarck, N. Dak. (505 m.)				Brownsville, Tex. (6 m.)				Buffalo, N. Y. (221 m.)				Charleston, S. C. (14 m.)				Coco Solo, C. Z. ^{1,2} (1 m.)				Denver, Colo. (1,616 m.)				El Paso, Tex. (1,193 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	30	960	-4.5	83	31	1,016	15.1	90	31	990	-4.6	83	31	1,016	7.9	77	23	1,013	26.7	82	31	837	0.7	75	30	881	10.1	52
500					31	959	14.1	86	31	956	-5.1	83	31	958	8.0	63	23	958	23.6	91								
1,000	30	902	-4.8	75	31	904	12.4	81	31	896	-7.6	78	31	901	5.2	62	23	904	20.5	79								
1,500	30	846	-5.4	72	31	852	11.4	71	31	840	-9.4	76	31	847	2.9	62	23	853	17.3	78								
2,000	30	793	-5.9	63	31	802	10.0	60	31	787	-10.6	72	31	796	1.0	60	23	804	14.9	71	30	798	0.0	73	30	799	7.5	48
2,500	30	745	-7.6	57	31	755	8.2	51	30	738	-12.5	68	31	748	-1.0	55	21	758	13.9	45	30	749	-2.4	70	30	752	4.2	48
3,000	30	698	-10.4	57	31	710	5.5	48	30	691	-14.6	63	31	702	-3.5	51	21	714	11.9	29	31	703	-5.5	67	30	707	6.6	47
4,000	29	612	-16.6	56	31	628	-7.4	41	30	604	-19.6	58	31	618	-8.6	46	14	633	6.0	19	31	618	-12.0	66	30	623	-6.7	48
5,000	29	535	-22.9	54	31	553	-7.5	44	30	528	-25.6	56	31	543	-15.2	44					31	542	-18.8	63	30	548	-13.6	42
6,000	29	466	-29.8	52	31	486	-14.5	39	30	459	-32.3	54	31	475	-21.8	43					31	473	-26.0	60	30	480	-20.9	38
7,000	29	404	-37.1	50	31	425	-21.3	38	29	397	-39.4	52	31	414	-28.9	42					31	411	-33.6	58	30	418	-27.9	37
8,000	29	349	-44.4		30	371	-27.6	37	29	342	-45.8		31	359	-36.1	41					31	355	-41.5		30	363	-35.1	35
9,000	29	300	-51.4		28	321	-34.2	36	29	294	-51.3		31	310	-43.1						31	306	-48.8		30	314	-42.3	
10,000	29	257	-57.1		27	278	-40.9		28	252	-49.6		31	266	-49.6						30	262	-54.8		30	270	-48.6	
11,000	28	219	-58.9		27	240	-47.4		28	216	-53.8		31	228	-54.9						30	224	-58.3		39	232	-53.3	
12,000	28	187	-56.3		26	205	-53.6		25	184	-52.7		31	195	-57.0						30	191	-58.2		30	198	-56.3	
13,000	27	160	-55.0		26	175	-58.7		25	158	-52.4		30	167	-57.7						30	163	-56.5		30	169	-58.1	
14,000	27	137	-55.0		25	149	-62.9		23	135	-52.7		29	142	-59.4						30	139	-56.1		30	144	-59.6	
15,000	23	117	-55.4		23	126	-66.8		21	116	-63.3		27	121	-61.6						30	119	-57.0		30	123	-62.3	
16,000	20	100	-56.7		19	107	-70.5		18	98	-64.3		26	103	-63.9						26	102	-58.0		30	105	-64.3	
17,000	11	86	-57.4		15	91	-71.7		14	84	-55.0		21	87	-63.1						23	87	-58.9		29	88	-65.5	
18,000	7	73	-57.7		13	76	-71.0		11	72	-54.7		13	74	-62.7						16	74	-59.6		26	75	-64.6	
19,000					9	64	-67.8						10	63	-61.6						11	63	-59.8		14	63	-62.7	

See footnotes at end of table.

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during March 1941—Continued

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Ely, Nev. (1908 m.)				Fairbanks, Alaska (153 m.)				Great Falls, Mont. (1,117 m.)				Joliet, Ill. (178 m.)				Juneau, Alaska (49 m.)				Ketchikan, Alaska (26 m.)				Lakehurst, N. J. (39 m.)			
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity
Surface.....	31	807	0.8	72	30	990	-6.9	59	31	888	0.7	66	30	998	-1.9	85	30	1,006	3.9	82	30	1,011	5.3	81	30	1,009	-1.7	76
500.....	30	947	-7.9	60	30	947	-7.9	60	30	947	-7.9	60	30	959	-2.6	83	30	952	1.6	83	30	953	3.8	79	30	953	-2.7	69
1,000.....	30	888	-8.7	62	30	888	-8.7	62	30	888	-8.7	62	30	900	-4.8	75	30	894	-1.5	86	30	896	0.7	77	30	895	-4.8	67
1,500.....	30	832	-9.7	65	30	832	-9.7	65	30	832	-9.7	65	30	844	-6.0	67	29	839	-4.5	85	29	842	-2.3	75	30	839	-6.4	63
2,000.....	31	798	-1.6	70	30	780	-10.9	67	31	796	-1.4	60	30	792	-7.5	63	27	788	-7.5	86	28	790	-4.7	70	30	787	-8.3	60
2,500.....	31	750	0.1	66	30	731	-13.8	68	31	747	-4.6	60	30	742	-9.1	59	25	738	-10.4	82	28	741	-7.1	64	30	737	-10.1	58
3,000.....	31	704	-3.8	66	30	684	-17.4	68	30	701	-8.1	61	30	696	-11.2	59	24	692	-13.7	80	28	695	-9.5	59	30	691	-12.2	55
4,000.....	31	620	-10.4	59	30	597	-23.6	66	30	616	-14.7	61	30	610	-16.6	61	21	606	-19.4	77	28	610	-15.4	58	30	605	-17.6	54
5,000.....	31	544	-16.6	53	28	520	-29.9	64	30	539	-21.1	57	29	533	-22.6	58	16	530	-25.2	72	26	534	-21.4	56	29	529	-23.7	52
6,000.....	31	475	-24.3	50	28	451	-36.8	62	30	470	-28.1	54	29	464	-29.1	54	14	461	-31.2	72	24	465	-28.3	54	29	461	-30.2	53
7,000.....	31	413	-32.1	49	28	390	-43.6	60	30	408	-35.3	52	28	402	-36.2	51	12	400	-37.6	60	20	403	-35.8	52	29	399	-36.9	56
8,000.....	31	358	-40.1	27	27	336	-49.6	59	29	352	-42.5	58	28	348	-43.4	57	11	346	-44.6	60	18	349	-43.0	59	29	345	-43.8	58
9,000.....	30	308	-47.6	26	26	287	-53.5	58	29	303	-49.3	58	28	299	-49.8	57	9	296	-51.5	59	17	300	-50.1	59	29	297	-50.1	58
10,000.....	30	264	-53.8	26	26	246	-54.3	57	29	260	-55.4	56	27	256	-54.2	55	6	254	-56.3	59	15	256	-56.0	59	29	255	-54.1	57
11,000.....	29	226	-57.5	26	26	211	-52.1	56	29	222	-58.0	55	27	220	-55.6	54	6	217	-57.6	59	15	220	-58.9	59	29	219	-55.9	59
12,000.....	29	193	-58.1	25	25	180	-50.4	55	29	190	-57.2	54	25	187	-54.7	53	6	185	-55.3	59	12	187	-57.3	59	28	187	-54.9	59
13,000.....	29	165	-56.7	24	24	154	-50.2	54	29	162	-55.2	53	24	160	-53.3	52	6	158	-52.1	59	11	160	-55.2	59	27	160	-54.0	59
14,000.....	29	141	-56.6	23	23	132	-49.5	53	29	138	-54.9	52	23	137	-53.7	51	6	135	-53.1	59	10	136	-54.7	59	26	137	-55.0	59
15,000.....	28	120	-57.7	21	21	114	-49.7	52	28	118	-55.2	51	21	117	-54.0	50	7	115	-52.9	59	7	117	-55.0	59	19	117	-56.4	59
16,000.....	27	103	-58.8	16	16	97	-49.8	51	27	101	-55.9	50	17	100	-54.7	49	6	100	-55.8	59	6	100	-55.8	59	14	100	-57.3	59
17,000.....	24	87	-59.4	12	12	84	-50.5	50	25	87	-56.6	49	11	85	-54.9	48	5	86	-55.6	59	5	86	-55.6	59	8	84	-58.8	59
18,000.....	17	74	-60.0	6	6	72	-51.4	49	19	74	-57.4	48	6	72	-56.0	47	5	74	-57.4	59	5	74	-57.4	59	8	74	-58.8	59

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																											
	Medford, Oreg. (401 m.)				Miami, Fla. (4 m.)				Nashville, Tenn. (180 m.)				Nome, Alaska (14 m.)				Norfolk, Va. ¹ (10 m.)				Oakland, Calif. (2 m)				Oklahoma City, Okla. (391 m.)			
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity
Surface.....	30	967	9.1	67	31	1,017	15.6	86	31	998	4.3	68	31	1,008	-10.9	70	23	1,019	3.0	63	31	1,014	12.3	80	30	973	5.4	71
500.....	30	956	10.4	66	31	959	15.0	78	31	959	3.8	67	31	946	-11.7	72	23	959	3.0	62	31	956	10.8	73	30	959	8.1	70
1,000.....	30	900	9.5	61	31	904	11.7	79	31	902	1.2	66	31	886	-11.9	74	23	901	0.6	48	31	900	8.4	67	30	903	3.3	64
1,500.....	30	847	5.8	62	31	852	9.6	68	31	847	-0.7	65	31	830	-13.1	73	23	846	0.6	46	31	847	5.9	61	30	849	3.3	61
2,000.....	30	796	2.3	64	31	802	2.0	56	31	795	-2.1	61	31	777	-15.2	72	23	795	-1.1	45	31	797	3.0	57	30	798	1.7	59
2,500.....	30	748	-0.5	62	31	755	6.5	46	31	747	-4.0	60	31	727	-18.1	72	23	746	-1.5	42	31	749	0.2	52	30	750	0.6	58
3,000.....	30	703	-3.1	58	31	710	4.1	44	31	701	-6.0	58	31	680	-20.8	70	23	703	-1.5	40	31	703	-2.6	59	30	704	-3.1	56
4,000.....	30	618	-9.6	55	31	627	-1.3	40	31	616	-11.9	56	31	593	-26.7	67	22	613	-1.5	37	31	619	-8.7	46	29	620	-9.2	56
5,000.....	30	543	-16.5	51	31	553	-17.3	36	30	540	-19.3	53	31	515	-32.9	68	21	538	-1.8	35	31	543	-15.7	42	29	544	-15.8	51
6,000.....	30	474	-24.0	49	29	485	-13.6	34	30	471	-25.2	51	31	446	-39.4	62	21	474	-1.8	33	31	475	-23.0	41	29	477	-22.9	45
7,000.....	30	412	-31.7	43	28	425	-20.0	34	30	410	-31.7	49	31	385	-45.4	54	21	412	-1.8	32	31	414	-30.9	41	28	414	-30.5	41
8,000.....	30	357	-39.7	47	28	371	-26.4	34	30	355	-39.0	49	31	331	-50.3	50	21	357	-1.8	31	31	359	-28.7	41	28	358	-38.0	41
9,000.....	30	308	-47.5	47	28	323	-33.3	34	30	306	-45.7	49	31	283	-52.9	49	21	308	-1.8	30	30	309	-46.0	40	26	309	-45.4	40
10,000.....	30	264	-54.8	47	27	279	-41.1	30	30	263	-51.7	49	29	243	-52.5	49	21	266	-1.8	29	30	266	-52.8	40	25	266	-51.6	40
11,000.....	30	226	-59.3	47	27	240	-48.4	29	29	226	-55.8	49	28	208	-51.0	49	21	227	-1.8	28	29	227	-57.7	39	25	228	-56.1	39
12,000.....	30	192	-60.1	47	27	206	-54.8	28	29	193	-57.0	49	27	178	-49.7	49	21	194	-1.8	27	28	194	-58.5	39	24	194	-57.8	39
13,000.....	30	164	-57.5	47	27	176	-60.8	28	28	164	-56.4	49	27	153	-49.5	49	21	165	-1.8	26	28	165	-57.5	39	23	166	-57.5	39
14,000.....	29	140	-56.6	47	26	149	-65.6	27	27	141	-56.8	49	24	131	-49.9	49	21	141	-1.8	25	28	141	-57.1	39	20	141	-58.3	39
15,000.....	28	119	-57.1	47	26	128	-70.0	26	25	120	-58.1	49	22	113	-50.3	49	21	120	-1.8	24	24	120	-58.1	39	19	120	-58.9	39
16,000.....	24	102	-58.5	47	24	108	-73.0	25	22	102	-59.6	49	16	96	-50.9	49	21	102	-1.8	23	22	102	-59.6	39	17	102	-60.6	39
17,000.....	21	87	-59.2	47	19	90	-74.0	22	22	87	-60.5	49	10	83	-51.6	49	21	87	-1.8	22	18	87	-60.7	39	15	87	-60.6	39
18,000.....	18	74	-59.1	47	13	76	-70.7	21	18	75	-60.4	49	10	73	-51.6	49	21	74	-1.8	21	14	74	-60.4	39	12	74	-60.1	39
19,000.....	14	63	-59.0	47	7	65	-66.6	21	11	63	-60.5	49	10	63	-51.6	49	21	63	-1.8	20	6	63	-60.					

TABLE 1.—Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during March 1941—Continued

Altitude (meters), m. s. l.	Stations with elevations in meters above sea level																											
	Omaha, Nebr. (301 m.)				Pearl Harbor, T. H. (0 m.) ¹				Pensacola, Fla. ¹ (24 m.)				Phoenix, Ariz. (339 m.)				Portland, Maine (9 m.)				Saint Louis, Mo. (171 m.)				Saint Paul, Minn. (214 m.)			
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity
Surface	31	984	0.7	78	30	1,018	20.2	77	31	1,017	12.3	75	31	974	12.0	79	31	1,008	-4.4	77	31	999	2.7	67	31	992	-3.0	80
500	31	960	0.4	74	30	962	18.0	79	31	961	10.7	67	31	956	15.4	61	31	948	-3.9	70	31	959	1.6	68	31	959	-3.4	80
1,000	31	902	-1.7	72	30	907	14.9	84	31	904	8.6	63	31	900	13.2	51	31	890	-8.4	68	31	901	-0.9	68	31	900	-4.9	79
1,500	31	847	-2.2	66	30	856	12.3	82	31	851	8.9	58	31	848	9.7	50	31	834	-8.4	67	31	846	-2.8	65	31	844	-6.0	75
2,000	31	795	-3.6	55	30	806	11.5	57	31	801	5.1	53	31	798	5.9	51	31	782	-9.6	69	31	794	-4.0	63	31	792	-7.1	69
2,500	31	746	-5.7	62	30	759	10.6	35	31	753	2.6	50	31	751	2.3	53	31	733	-11.4	65	31	745	-5.9	62	31	743	-8.9	65
3,000	31	700	-8.3	60	30	715	9.0	23	31	708	0.1	48	31	705	-1.2	54	31	686	-14.1	64	31	699	-8.3	61	31	696	-10.8	61
4,000	31	614	-13.9	57	30	633	4.3	11	31	624	-5.5	51	31	622	-7.3	45	31	601	-19.5	62	31	614	-14.3	59	31	610	-16.9	58
5,000	31	538	-20.5	53					29	548	-11.9	56	31	546	-14.4	41	30	524	-25.0	57	30	537	-20.8	56	30	533	-23.1	57
6,000	30	469	-27.1	51					25	480	-18.7	56	30	478	-21.7	38	30	456	-31.6	56	30	468	-27.6	53	30	464	-30.0	55
7,000	29	407	-34.7	50					24	419	-26.0	56	30	416	-29.3	38	30	395	-38.6	57	30	406	-34.5	50	30	403	-37.2	54
8,000	29	352	-42.1						21	364	-33.0	59	30	361	-37.0	37	30	341	-45.1		29	352	-41.9		30	348	-44.4	
9,000	28	303	-49.1						19	315	-39.8		30	312	-44.1		29	293	-50.0		28	302	-49.1		30	298	-51.3	
10,000	28	269	-54.6						17	272	-46.4		30	268	-50.2		27	251	-51.2		26	259	-54.7		30	255	-56.0	
11,000	28	222	-57.0						15	234	-53.0		29	230	-54.6		26	216	-50.2		24	222	-58.1		30	219	-57.4	
12,000	28	189	-57.2						10	200	-58.1		29	197	-56.7		26	185	-50.0		24	189	-58.6		30	186	-54.9	
13,000	28	162	-55.3						7	170	-61.3		28	168	-56.9		21	159	-50.6		23	162	-57.1		30	159	-53.8	
14,000	26	138	-54.9									27	143	-58.3		19	136	-51.8		21	138	-57.0		30	136	-54.0		
15,000	24	118	-55.5									25	122	-60.3		14	117	-52.9		18	118	-57.5		29	116	-54.7		
16,000	19	101	-56.2									24	104	-62.7		10	100	-54.1		17	100	-58.2		28	100	-55.6		
17,000	11	86	-56.5									24	88	-63.9		5	85	-55.9		15	85	-58.7		23	85	-56.3		
18,000												19	75	-63.2						12	73	-58.6		17	72	-56.8		
19,000												13	64	-62.0									7	62	-56.9			

Altitude (meters) m. s. l.	Stations with elevations in meters above sea level																										
	St. Thomas VI ¹ (8 m.)				San Diego, Calif. ¹ (19 m.)				San Juan, P. R. (15 m.)				Sault Ste. Marie, Mich. (221 m.)				Seattle, Wash. ¹ (27 m.)				Spokane, Wash. (598 m.)						
	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature	Relative hu- midity	Number of ob- servations	Pressure	Temperature
Surface	30	1,017	25.9	74	27	1,012	15.9	80	31	1,014	23.3	85	31	991	-6.7	78	31	1,013	9.9	76	31	946	4.2	79			
500	30	961	22.4	89	27	955	13.3	70	31	959	21.8	83	31	956	-7.4	79	31	956	9.1	64	31	947	5.2	63			
1,000	30	908	19.3	86	27	901	10.7	66	31	906	18.4	83	31	897	-9.3	77	31	901	6.0	62	31	901	6.0	62			
1,500	30	856	16.2	82	27	848	8.0	60	31	854	15.5	80	31	840	-11.1	73	31	847	2.6	63	31	847	2.6	63			
2,000	30	807	13.8	79	27	798	5.1	55	31	805	13.8	68	31	787	-12.7	70	31	796	-0.7	64	31	796	-0.7	64			
2,500	30	761	13.4	59	27	750	1.9	53	31	759	13.0	45	31	747	-14.4	69	31	747	-3.5	65	31	747	-3.5	65			
3,000	30	717	12.4	39	27	705	-0.7	47	30	715	11.1	36	31	690	-16.5	68	31	701	-6.5	63	31	700	-7.9	61			
4,000	30	636	8.7	16	25	621	-6.8	38	30	634	6.3	26	31	603	-21.6	66	31	616	-12.6	61	31	615	-13.9	58			
5,000					25	546	-13.6	32	29	560	0.7	23	31	526	-27.8	64	31	539	-19.3	62	31	539	-20.5	56			
6,000					24	478	-21.0	33	28	494	-5.6	22	31	457	-34.4	61	31	471	-26.6	63	31	470	-27.6	54			
7,000					22	416	-28.3	29	28	434	-12.4	22	31	395	-41.1		31	409	-34.0	65	30	407	-35.2	53			
8,000					22	362	-35.7		28	380	-19.9	21	31	340	-47.5		31	354	-41.7		30	352	-42.9				
9,000					22	312	-43.1		28	331	-27.5	21	31	292	-52.6		31	304	-49.5		30	303	-50.1				
10,000					22	269	-49.8		28	288	-35.4	21	31	250	-54.8		31	261	-56.4		29	259	-56.9				
11,000					20	230	-54.2		28	243	-43.4		31	214	-53.8		31	223	-60.4		29	222	-60.2				
12,000					20	196	-57.3		28	214	-51.0		31	183	-52.9		30	190	-60.5		29	189	-59.6				
13,000					17	168	-57.9		27	183	-58.8		31	157	-52.5		30	162	-57.9		29	161	-56.8				
14,000					14	144	-59.1		27	155	-66.5		28	134	-52.8		30	139	-56.9		27	137	-56.3				
15,000					11	122	-61.0		24	131	-73.5		25	115	-53.4		27	118	-56.8		27	117	-56.7				
16,000					9	104	-62.7		23	110	-78.9		25	98	-54.0		24	101	-57.4		26	100	-57.2				
17,000									23	93	-80.4		18	84	-54.9		20	85	-58.1		25	86	-57.6				
18,000									20	77	-76.7		9	72	-55.4		10	72	-58.6		20	73	-58.1				
19,000									15	65	-70.6						6	60	-58.8		9	62	-58.9				
20,000									9	54	-65.8																

See footnotes at end of table.

